Daylight photodynamic therapy for actinic keratosis

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LETTER TO THE EDITOR

Daylight photodynamic therapy for actinic keratosis: Is it affected by the British weather?

Dear Editor, daylight photodynamic therapy (DPDT) is a simple, well-tolerated, convenient treatment option for patients with actinic keratosis (AK).[1] It is particularly suitable for patients with field-change AK on the face and scalp, for whom the pain and frequency of treatments can be problematic and limiting if treated with conventional PDT. The pain experienced during DPDT is considerably lower than that encountered during conventional PDT as, after application of photosensitizer pro-drug, there is continuous synthesis and photoactivation of low levels of protoporphyrin IX (PpIX) during the daylight exposure period.[1,2] Treatment employs daylight exposure, which encompasses the combination of direct and diffuse sunlight outdoors during daytime, and in Northern Europe, this is generally from April to September. The daylight emission spectrum consists of ultraviolet, visible and infrared radiation, although it is largely the visible component that is of therapeutic importance in DPDT.

Early trials comparing daylight and conventional PDT for AK confirmed that DPDT was as effective as conventional PDT but was much less painful.[3-5] We therefore introduced the first use of DPDT in Dundee, Scotland, in 2013 and reported on our early experience in 2013-2015, with 64 patient treatments, showing clearance or good response in 73%, with very low pain scores and high levels of patient satisfaction.[6]

However, suitability of DPDT is subjected to favourable weather conditions, and we wanted to investigate whether the quality of the weather in the DPDT season (April-September) influenced treatment outcomes following DPDT.

To answer this question, we compared our DPDT treatment outcomes from 2016, 2017 and 2018. These are reported in Table 1, accompanied by a range of weather metrics, which provide information on the "quality" of the DPDT season. Weather metrics were obtained retrospectively from The Met Office[7] (Leuchars, UK), with the exception of median temperatures on treatment days, which were recorded on the treatment day from the BBC Weather website.[8] Reported weather metrics do not include extent of cloud cover. Previous literature has indicated that successful daylight PDT can be performed on overcast days during the treatment season.[2]

We performed 142 treatments over 65 separate treatment days in 2018, double that of previous years. In 2018, there was much less rainfall, many more sunshine hours (Table 1) but the median treatment day temperatures were similar. With more favourable weather conditions (less rain, more sunshine) over the course of our DPDT season, we were able to carry out more treatments and select more days that were suitable for treatment.

However, the response to treatment at 3 months postfinal treatment session was comparable across the three years despite the differences in rainfall and sunshine hours. One-third of patients achieved excellent outcomes in 2017 and 2018, and 63% had a moderate/good response in 2018% vs 59% in 2017 and 69% in 2016. This similarity in efficacy is likely due to good treatment planning, with DPDT only being undertaken on days which we predict will have favourable weather conditions. The more frequent dry and sunny days in 2018 allowed us to treat more patients in that year but did not improve treatment outcomes. The similarity in the median treatment day temperature data evidences the careful selection of treatment days. Thus, whilst this is a retrospective review of our clinical data, it is reassuring for practitioners and patients as it indicates that, with good treatment planning, DPDT is an effective, well-tolerated, convenient treatment for patients with field-change AK, irrespective of the quality of the British summer weather.

KEYWORDS

actinic keratosis, photodynamic therapy, weather

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CONFLICTS OF INTEREST

SI has received conference travel expenses and honoraria from Galderma. PO and EE have received travel expenses from Galderma.

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TABLE 1 Daylight photodynamic therapy treatment parameters and outcomes: Response to treatment, pain score, erythemal response, exposure time and dose

Year	2016	2017	2018
Median Dundee Temperature of treatment days (range) °C	15.5 (6-23)	15 (6-18)	15 (10-25)
Sunshine hours (April-September)	918.5	985.7	1131.5
Rainfall (mm, April-September)	321	380.6	239.2
Number of treatments[a]	71	64	142
Number of treatment days	31	34	65
Number of patients treated	26	22	43
Efficacy[b]	23% clear 31% good 38% partial 8% poor/no response	0% clear 32% excellent 41% good 18% moderate 9% slight/no response	0% clear 30% excellent 37% good 26% moderate 7% slight, no response
Median Pain Score (range)	0.7 (0-9)	1.9 (0-9)	0.7 (0-9)
Erythema	19% severe 63% mild to moderate 10% none 8% no data	10% severe 79% mild to moderate 6% none 5% no data	10% severe 78% mild to moderate 9% none 3% no data
Median Exposure Time (range) min	150 (120-450)	153 (75-375)	150 (60-285)

[a]Patients may have multiple areas treated in one treatment.

[b]Semiquantitative scoring of efficacy (the wording of the grading system differed slightly in 2016 compared with 2017 and 2018). 2016: Clear = no/minimal remaining disease, Good > 75% clearance, Partial > 50%-75%, Poor/no response <50% clearance. 2017/2018: Clear = no remaining visible disease, Excellent = minimal remaining disease, Good > 75% clearance, Moderate > 50%-75% clearance, Slight/no response <50% clearance.

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